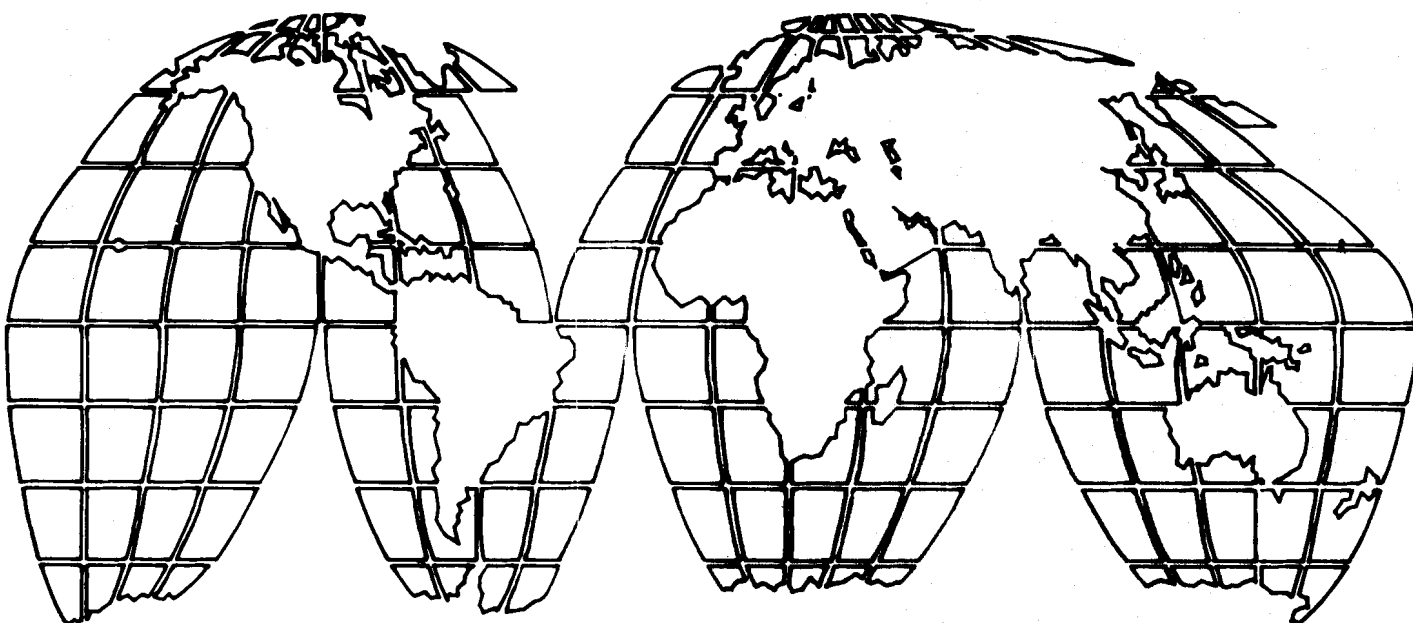


A.I.D. Evaluation Special Study No. 23

Private Sector Development in the Thai Seed Industry

BEST AVAILABLE



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PRIVATE SECTOR DEVELOPMENT IN THE
THAI SEED INDUSTRY

AID SPECIAL STUDY NO. 23

by

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The views and interpretations expressed in this report are those of the authors and should not be attributed to the Agency for International Development.

TABLE OF CONTENTS

	<u>Page</u>
Foreword.....	v
Summary.....	vi
Preface.....	ix
Glossary of Abbreviations and Technical Terms.....	xi
Map.....	xiv
1. Introduction.....	1
2. Factors in the Development of a Modern Seed Industry.....	2
2.1 Policies of the Royal Thai Government.....	2
2.2 Thai Universities.....	3
2.3 USAID Program.....	4
2.3.1 Participant Training.....	4
2.3.2 Crop Development Program.....	5
2.3.3 Seed Development Loans I and II.....	5
2.3.4 Other AID Projects.....	8
2.4 Other Donors.....	8
2.4.1 Japan.....	9
2.4.2 European Economic Community.....	9
2.4.3 Food and Agriculture Organization.....	9
2.4.4 International Center for Maize and Wheat Improvement.....	10
2.5 Domestic and International Private Seed Initiatives.....	10
2.6 Banking and Credit.....	12
3. Current Government/Private Sector Relations.....	15
3.1 Seed Club.....	15
3.2 Seed Regulations.....	15
3.3 Differential Pricing.....	16
4. Conclusions and Suggestions.....	17
4.1 Conclusions.....	17
4.2 Suggestions for the Royal Thai Government.....	18
4.3 Suggestions for USAID.....	19

TABLE OF CONTENTS (cont.)

Appendixes

- A. Seed Policy of the Royal Thai Government
- B. Support of the Private Sector by the Royal Thai Government
- C. Thai Seed Requirements, 1984-1986
- D. Estimated Seed Production of the Department of Agricultural Extension Seed Program, 1984-1986
- E. Department of Agricultural Extension Seed Centers
- F. The Seed Club of Thailand
- G. Thai Private Sector Seed Industry

Bibliography

FOREWORD

This study is one in a series undertaken by the Center for Development Information and Evaluation, Bureau for Program and Policy Coordination, to examine Agency for International Development (AID) experience with the implementation of the Private Sector Development Initiative since 1981.

The other related papers in the series are as follows:

AID Program Evaluation Report No. 14, (PN-AAL-049)
A Review of AID's Experience in Private Sector Development, April 1985

AID Evaluation Special Study No. 24, (PN-AAL-050)
Management Education in Modern Tunisia: L'Institut, Superieur De Gestion, Tunis, April 1985

AID Evaluation Special Study No. 25, (PN-AAL-051)
Ecuador Industrial Development Finance, June 1985

AID Evaluation Special Study No. 26, (PN-AAL-052)
Promoting the Manufacture and Use of Small-Scale Agricultural Machinery in Indonesia, June 1985

AID Evaluation Special Study No. 29, (PN-AAL-054)
Private Development Corporation of the Philippines, Summer 1985

We are indebted to the authors of these papers for their contributions to AID's understanding of the role of the private sector in development, and of the Agency's role in that development.

W. Haven North
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and Evaluation
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SUMMARY

One in a series of private enterprise development Special Studies commissioned by the Bureau for Program and Policy Coordination of the Agency for International Development (AID), this study focuses on the two AID Seed Development Loan projects in Thailand. It reviews the development of Thailand's seed industry and identifies those factors that have been critical to its development and growth. It is not an evaluation; rather, by providing an overview, it attempts to describe what has been a relatively successful blending of public and private interests and efforts leading to the new, "modern" seed industry of Thailand. This modernization was accomplished within 9 years. Thailand's rudimentary seed industry, with a few indigenous producers (mainly in vegetable seed), evolved into a modern industry with five operating private seed companies, each in a joint venture with a major international seed firm.

Standard project documentation, status reports, and evaluations were reviewed to provide background for extensive interviews with public, private, and education sector representatives (see Appendix A for a complete listing of interviewees). Information obtained through interviews, when applied to standard industry development models, yielded conclusions on the significance of certain elements observed in this specific case. These elements were critical to Thailand's attaining its "modern" seed industry status. A weakness with this methodology and its presentational format is that it presupposes the reader's familiarity with the seed industry in general.

Seed Development Loan I, signed August 1975 for US\$3.7 million, was "to cause the use of improved seed on Thai farms" to result in "an increase in productivity and income of Thai farmers." Seed Development Loan II, signed July 1981 for US\$6.1 million, is "a comprehensive seed program that efficiently and cost-effectively increases farmers' use of higher quality seed while steadily increasing the role of the private sector to supply this seed." Under the former, there was a failed attempt to develop a Government marketing body for improved seeds. The present project recognizes the role of the private sector in the production and marketing of improved seeds and seeks to enhance its performance. One component has been the creation of a "Seed Club" comprising all participants in Thailand's seed industry, including public, private, and education sector representatives.

The implementing agency is Thailand's Department of Agricultural Extension, Ministry of Agriculture. The projects have provided technical assistance from Mississippi State University (MSU), as well as capital assistance to help finance six "seed centers." These centers process improved seeds of various species, but their primary purpose is to produce improved rice seed

for distribution to drought and flood victims. In addition, they process improved variety corn seed for distribution and sale and are capable of processing sorghum, soybeans, and mung beans as well. They also serve as technology demonstration and training centers for private sector seed producers.

MSU and AID have conducted policy dialogue through this project, principally through the development and promotion of, and participation in, the Seed Club.

The business climate was critical to the development of Thailand's modern seed industry. Thailand has enjoyed a free enterprise tradition and a stable socioeconomic system since its origin. There is a conspicuous absence of any Government inclination to interfere in free market forces. Public infrastructure is well developed. The Government encourages private sector participation through Board of Investment incentives, (e.g., tax holidays and reductions). There is a supply of highly trained, qualified technical specialists available to the private sector.

Government and university research and development efforts extending back to the mid-1940s have produced the improved genetic materials essential to the production of appropriate improved seeds. The genetic breakthrough represented by the development and introduction of Suwan I corn in 1975 provided the stimulus necessary for a demonstration of the commercial viability of varietal seed production and led to the development of a ready market for subsequent hybrid seed products.

Donor economic assistance programs, including those of AID, have been instrumental in the development of the seed industry. AID has assisted in road construction, electrification, flood control, irrigation, rural planning, and public institutional development; provided significant contributions to the research effort in the early 1950s and into the 1960s, including support through the Rockefeller Foundation; provided and continues to provide assistance to the Board of Investment; and maintains a participant training program responsible for the availability of qualified technicians. Other donors, such as Japan and the European Economic Community (EEC), have provided support in similar areas and have financed the construction of additional seed centers.

Timing was critical to the success of AID's seed development projects. Seed Development Loan I was begun at the moment the Suwan I corn seed innovation was ready for introduction. This innovation was necessary for the seed centers to attract the attention of the potential private sector seed producers. Suwan I was the first corn seed developed that produced corn resistant to downy mildew, a severe disease prevalent in the tropics and particularly virulent in Thailand. The AID-financed seed centers, ostensibly established for rice seed production, were

able to demonstrate appropriate design technology by being able to process corn seed as well and, as a result, were able to demonstrate the market potential for improved seed and the willingness on the part of Thai farmers to pay a premium for the new hybrids. This combination drew the private sector into corn seed production and into hybrid seed development. This would not have been possible without the Suwan I innovation.

The transfer of appropriate technology was a critical element of AID's projects. The design of the seed centers is particularly appropriate. They are small scale, located in rural areas close to production and markets, and capable of processing various kinds of seeds. They serve the needs of the Government program admirably and have served as models for the private sector. As important as the technical hardware is, the technicians provided by MSU are equally important. Dr. Bill Gregg and Mr. George Dougherty provide guidance to both the Government and private sectors. Their dedication to the program has contributed more than could have been anticipated. The quality of personnel has made a major impact on the development of Thailand's seed industry.

PREFACE

The evaluation unit of the Bureau of Policy and Program Coordination of AID initiated a private enterprise development Special Study series to illustrate examples of successful private sector initiatives promoted by AID-supported government programs. USAID Thailand's two Seed Development Loan projects were selected for special study after a review of country program documentation indicated significant growth in Thailand's seed industry.

The study team approached the task recognizing that the AID relationship with the Royal Thai Government (RTG) was only one factor among many in the rapid, positive developments in the Government and private seed sectors since 1975. The team viewed the purpose of the study, which is not an evaluation, to be a review of the development of Thailand's seed industry, identifying those factors critical to its development and growth, the linkages between those factors, and the relative importance of each. Fieldwork for this study was completed by May 1984.

Thailand and its people are worthy of emulation by many developing countries. A centuries-old socioeconomic system and peaceful people represent its special heritage. The Thai seed industry is succeeding in large part because Thailand is Thailand. The level of this success is significant, and, with confidence in Thai pragmatism, we envision continued measured progress maintaining the careful balance between Government and private sectors.

Other developing countries should learn from the Thailand experience. They must begin with careful planning, building a sound foundation, and proceed deliberately with patience and a commitment to sustained effort. Thailand's seed industry development began over 30 years ago but its modernization and most dynamic growth have occurred only in the last 9 years. Although many of the specific experiences and suggestions contained in this study are universally applicable, the most important lesson to be learned is that there are no shortcuts.

This study team's experience in Thailand revealed much of what has contributed to Thailand's success. In our 3-week visit, we were easily able to conduct 53 interviews while traversing nearly 600 miles of Thailand. This is possible only where there are genuinely helpful people and a highly cooperative spirit. We found these characteristics in USAID Bangkok, Kasetsart University, the many Royal Thai Government offices, small merchant shops, major commercial banks, and all private companies; in short, these characteristics permeated Thailand. Our intensive study tour was at once productive and pleasurable. We owe a debt of gratitude to all those who assisted us and offer this report as partial repayment. We would especially like to thank Robert

Halligan, Director, USAID Bangkok, John Foti of the AID Office of Agriculture and Rural Development, and the entire USAID staff, without whom we would not have been able to complete this study. We were particularly pleased with the addition of Uoychai Vattraphoudej to the team. His experience and knowledge of the program, as well as his direct support, contributed immeasurably to this report. Finally, we want to thank Petcharat Wannapee, Director of the Seed Division, Department of Agricultural Extension, and his colleagues, including Bill Gregg and George Dougherty of Mississippi State University, for their assistance, and to wish them continued success.

Larry Brown
Team Leader

GLOSSARY

Abbreviations

BAAC	- Bank of Agriculture and Agricultural Cooperatives
BOI	- Board of Investment
C-P	- Chareon Pokphand Group of Companies
CIMMYT	- International Center for Maize and Wheat Improvement
CMU	- Chiang Mai University
DOAE	- Department of Agricultural Extension
EEC	- European Economic Community
FAO	- Food and Agriculture Organization, United Nations
IESC	- International Executive Service Corps
JICA	- Japanese International Cooperation Agency
KKU	- Khon Kaen University
KU	- Kasetsart University
MSU	- Mississippi State University
OECD	- Overseas Economic Cooperation Fund
RTG	- Royal Thai Government
USAID	- U.S. Agency for International Development

Technical Terms

Species - A class of related individuals with common attributes. Rice is a species made up of related but varying types of rice. So corn, sorghum, soybean, and all other plant groups of closely related individuals are each a different species.

Variety - One individual, repeatable set of plant characteristics within a species. Example: Suwan 1 is a corn variety within the corn species.

Open-pollinated - Varieties are open-pollinated, meaning that production of the variety reproduces a seed crop genetically the same as the variety planted. Genetic purity can be affected by uncontrolled crossing caused by pollinating insects or seed mixing caused by poor handling. Open-pollinated varieties generally can be reproduced easily by farmers as well as by seed industry professionals. The variation in maintenance of varietal purity is a key quality factor.

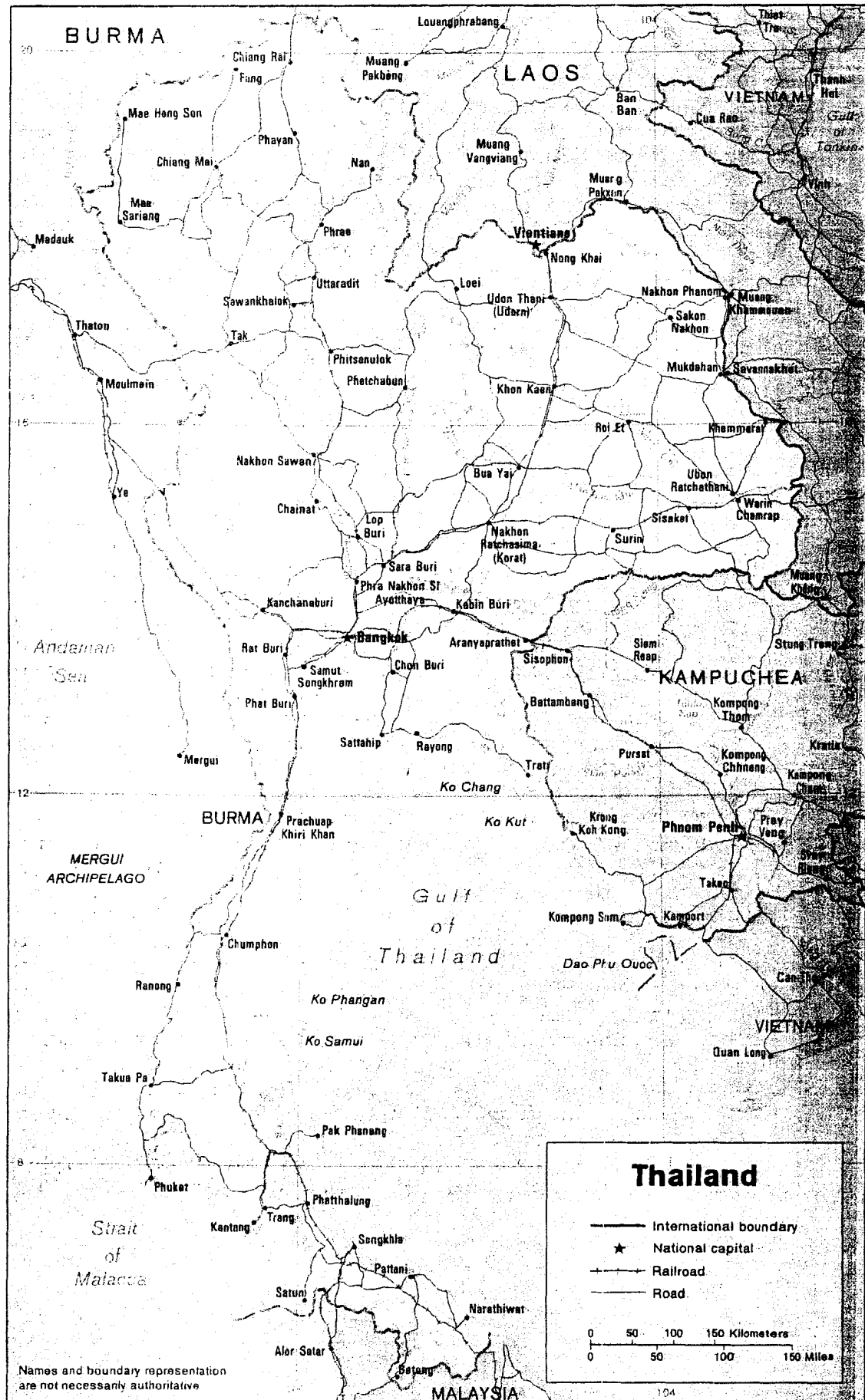
Hybrid - A hybrid is produced by combining two or more inbred parents within a species. Producing hybrid seed is more technical than producing varieties and is generally performed by professional seedsmen. It has not been possible to hybridize all species. Hybrids will not reproduce themselves true-to-type from seeds of the hybrid production. The advantages of hybrids are the ease of introducing new characteristics through breeding and improved yield due to hybrid vigor. Examples of species in developed countries that are hybrids are corn, sorghum, and sunflowers.

Farmer-caught seed - Seed of an open-pollinated variety saved (caught) from a farmer's production of a species to be replanted by the farmer, sold to another farmer, or moved into commercial marketing channels. These seed are generally found on farms and in retail shops subject to little technical handling or quality control with no labeling as to varietal purity, germination, or mechanical purity.

Contract seed grower - A farmer contracted by a seed company or government organization to produce seed. The buyer recommends farming practices--from land preparation to harvesting methods--known to ensure varietal purity and quality seed, provides the farmer with parent seed, supervises production, and receives the seed crop produced by the farmer.

Seed processing - Sometimes referred to as "seed conditioning," seed processing consists of seed drying, shelling in the case of corn, removal of foreign matter, grading (separating high and low quality seed), applying chemicals to the seed, bagging, and tagging (affixing a label to the seed container providing product and quality information). Seed processing is a technical activity best performed by trained professionals.

Rai - Unit of land measure in Thailand: 1 Hectare = 6.25 rai;
1 acre = 2.84 rai.



1. INTRODUCTION

Thailand is an agriculture-based economy with the majority of its people (over 70 percent) directly involved in agricultural pursuits. Because of this the Royal Thai Government (RTG) has accorded a high priority to programs supportive of agricultural development. Thailand has had a complex domestic trade network and an equally sophisticated international trade network for centuries. These trading activities have been performed by private enterprise influenced primarily by free market forces. The Government has generally refrained from market control actions. This combination of factors set the stage for the development of the Thailand seed industry: a Government committed to supporting agriculture development efforts within the context of a free enterprise, market-based economy.

Historically, farmer seed needs were met either by the farmers' retaining seed stock from their harvests or from grain traders and shopkeepers who would retain seed stock. This was a rudimentary seed industry which resulted in a supply of unimproved and generally unprocessed seeds. The private distribution network utilized was the same network that is used today by the newly developing private corn seed industry and the older, established vegetable seed companies. A private vegetable seed company, Chia Tai, was established in 1921, importing and introducing improved vegetable seed varieties. This firm and this segment of the seed industry developed over time to the point that improved seed was being developed, multiplied, processed, and distributed domestically and even exported.

The RTG actively entered the field of crop improvement in the 1940s, concentrating on rice and corn, Thailand's two most significant crops in terms of hectarage planted, consumption, and export sales. The program was multipurpose, intended to result in increased yields, benefiting both farmers and the economy as a whole, and to develop a Government capacity to produce improved seed stocks for distribution to victims of droughts and floods. The RTG is committed to production and distribution of improved varieties and quality rice seed stocks. The RTG also conducts research and development of improved varieties of other major crops such as corn, sorghum, mung bean, peanut, and soybean, as well as a few minor crops. The critical historical event was the development and introduction of Suwan 1 in 1975, an improved corn variety developed at Kasetsart University with RTG, Rockefeller Foundation, USAID, and other support. Its development and introduction marked the beginning of Thailand's modern private seed industry.

2. FACTORS IN THE DEVELOPMENT OF A MODERN SEED INDUSTRY

Thailand's seed industry has progressed because of a number of critical interrelated factors carefully balanced and linked to provide adequate encouragement, incentives, and control. The industry could be set back quickly if the factors become negative or out of balance.

2.1 Policies of the Royal Thai Government

One critical factor was the deliberate role chosen by the RTG. In the 1940s, the RTG began an active research and development program intended to introduce improved crop varieties. The program was modest and recognized the necessary long-term nature of support. Promising results came with the introduction of an improved corn variety in 1951. The research program continued and expanded with support coming from the Rockefeller Foundation, USAID, and other international organizations.

In 1975, this continuing research program introduced a new corn variety named Suwan 1, which was higher yielding than local varieties and, most important, resistant to the devastating downy mildew disease which took a heavy annual toll on Thailand's corn production. The development and introduction of Suwan 1 was the catalyst for the subsequent rapid development of an emerging modern private seed industry in corn variety and hybrid corn and sorghum activities. Suwan 1 served as a catalyst for private enterprise because it (1) represented a major genetic breakthrough, (2) demonstrated farmer acceptance of an improved variety and higher seed quality at a higher price, and (3) was in greater demand than the RTG program could supply.

These conditions caught the attention of both domestic and foreign agribusiness firms, which promptly entered the business. The result has been a doubling of corn production since the introduction of Suwan 1 through the combined efforts of the RTG and private enterprise.

The RTG has not limited its efforts to corn research. Major programs have been pursued in rice, sorghum, peanuts, soybeans, mung beans, and, more recently, vegetables. This long-term research commitment has been critical to the development of Thailand's seed industry. Although the new private seed sector is currently most interested in corn and sorghum, it is likely to move into seed of other crops in the future.

Along with research there have been efforts by the RTG to disseminate knowledge and new technologies to both farmers and private enterprise. The RTG efforts have been strongest in training and research, in the hope that the private sector will at least share in the responsibility for production and distribution of improved seed. The RTG has developed, multiplied, processed, and distributed its improved seeds, thereby setting an example for private enterprise as well as performing a market testing and development function.

In addition, the RTG is developing an extensive and increasingly effective Department of Agricultural Extension (DOAE) with over 5,000 agents residing in the field. This extension service is expanding and now reaches most farmers with advice on improved management practices, including all inputs. This extension effort has encouraged farmers to purchase improved seed varieties and to apply essential agriculture inputs to improve yields. The DOAE agent system is still young and could become a much more effective force in the future when a full complement of agents is trained and in place.

In the more recent past, to encourage increased private involvement in the seed industry, the RTG through the Board of Investment (BOI), provided investment incentives for domestic and foreign firms entering the seed industry, such as tax holidays for both and assured repatriation of profits for foreign firms. This action has served to accelerate the expansion of Thailand's private seed industry.

The long-term commitment to research, dissemination of knowledge, and provision of incentives and encouragement are integral to RTG policy concerning the seed industry. These policies are being implemented within overall RTG policy of encouraging the development and growth of its free enterprise, market-based economy. RTG policies and actions as viewed by the private seed sector are mostly positive, but a few negative aspects need to be resolved, principally the price differential between RTG-produced and private sector seed.

2.2 Thai Universities

Thailand has developed an extensive university system, which includes several major agricultural programs. Broadly speaking, this system provides Thailand with high-caliber personnel in all areas, an essential element for continued economic development. Within agriculture, Kasetsart University is foremost. Although its main campus is near Bangkok, it operates a major research farm near Korat where Suwan 1 was developed. An important function of the University is to undertake continuing research on

improved varieties and hybrids of major crops. In addition, a program currently underway produces foundation seed of varieties and hybrid inbreds for distribution to and multiplication by both Government organizations and private enterprises.

The university system has played, and continues to play, a critical role. It represents the seat of knowledge, research, and learning for all sectors in Thailand. It plays an active role in the implementation of many RTG programs. A positive factor of Thailand's system is the continuing dialogue, exchange of ideas, and sharing of experiences between its faculty and graduates. In addition, it supports the necessary open dialogue between Government policymakers and private enterprise, with the universities often serving as the forum or bridge.

In the seed industry, Kasetsart University represents an excellent example of such a bridge. Besides conducting their own research, development, and teaching programs, the faculty welcome requests and contracts from private enterprise for specific research activities and are always available to provide tailored, short courses. Kasetsart University's National Corn and Sorghum Research Center near Korat is a research and breeding station producing foundation seed used by Government agencies and the private sector. In addition, the Center is an active participant on major policy setting bodies within the RTG and in the Seed Club (see Section 3.1). Through its influence, guidance, and general support the University has played a very important role in the growth of Thailand's seed industry.

2.3 USAID Program

Any discussion of AID's role in the development of Thailand's private seed industry cannot be limited to the two Seed Development Loan projects. These projects were only part of what AID provided that was critical to obtaining today's successes.

2.3.1 Participant Training

In its 32 years in Thailand, AID has sponsored nearly 11,000 Thai participants for varying levels of education and training in the United States. A majority of these pursued agricultural studies. A high-quality education and knowledge of U.S. management practices, as well U.S. attitudes and lifestyles, are evident at all levels of the RTG, the Thai university system, and the Thai private sector. Moreover, the training established a technology and knowledge base fully compatible with U.S. industry. These

factors were essential ingredients for subsequent AID programs and for the establishment of private sector linkages between Thailand and the United States.

Nearly all RTG, university, and private banking offices have U.S.-educated seed specialists or agronomists with seed technology knowledge on their staffs. Many were in place prior to 1975, the start of Seed Development Loan I. This personnel base was a critical factor in the successful implementation of the RTG seed program. It has also been important to the rapid development of the private seed industry, because private enterprise had available a supply of well-educated and experienced Thais. This availability fueled the formation and development of joint Thai-foreign private ventures in the seed industry.

2.3.2 Crop Development Program

One of the first areas of cooperation between the RTG and AID was in the development and promotion of crops other than rice. The major area of concentration was in corn. It was out of this effort, joined by the Rockefeller Foundation and others, that Suwan 1 was developed and ultimately introduced in 1975. A motive for the RTG in this effort was the development of an alternative crop appropriate for Thailand for which there was a significant market. This motive and activity did not go unnoticed by international U.S. firms trading in grain, such as Continental Grain and Cargill, which also have significant interests in the seed industry. With the development of Suwan 1, several foreign seed firms joined with Thai private enterprise to launch their own seed research programs. The RTG research programs were a matter of public record with results openly shared with private enterprise. The RTG's persistent pioneering efforts, with the support of AID, the Rockefeller Foundation, and others, were critical to the development of Thailand's modern private seed industry.

2.3.3 Seed Development Loans I and II

The two Seed Development Loan projects supported by AID have served as critical factors to the development of Thailand's modern private seed industry in a number of ways. Seed Development Loan I, signed August 1975 for \$3.7 million, was "to cause the use of improved seed on Thai farms" to result in "an increase in productivity and income of Thai farmers." Seed Development Loan II, signed July 1981 for \$6.1 million, is "a comprehensive seed program that efficiently and cost-effectively increases farmer's use of higher quality seed while steadily increasing the

role of the private sector to supply this seed." Under the former, there was a failed attempt to develop a Government marketing body for improved seed distribution. The present project recognizes the role of the private sector in the production and marketing of improved seeds and seeks to enhance its performance. One component has been the creation of the Seed Club, comprising all participants in Thailand's seed industry, including public, private, and education sector representatives.

The implementing agency is Thailand's Department of Agricultural Extension, Ministry of Agriculture. The projects have provided for technical assistance from Mississippi State University, as well as capital assistance in financing six seed centers, which process improved seeds of various species. Their primary purpose is to produce improved rice seed for distribution to drought and flood victims. In addition, they are now processing improved variety corn seed for distribution and sale and are capable of processing sorghum, soybeans, and mung beans as well. They also serve as technology demonstration and training centers for private sector seed producers.

Rice Seed. The primary purpose of the seed centers established under these projects was the production, processing, and distribution of quality rice seed to poor farmers under special RTG programs. The production and distribution of rice seed is not commercially attractive to private enterprise in Thailand because of low profit margins, but the activity is essential, nonetheless, as rice is a staple in the Thai diet and a major export commodity.

Mississippi State University. Mississippi State University (MSU) has played an important role in the development and growth of Thailand's modern private seed industry. Besides providing key advice on RTG policy formulation, technical design, operation assistance, and extensive training and education, the individuals from MSU directly involved in the project have done much to bring the industry to its current level of development. MSU is particularly well qualified to provide the technical inputs typically enumerated in AID Project Papers and has performed admirably under Seed Development Loans I and II. What cannot be designed into a project and should not be assumed is the quality of individuals who will implement a project. In this instance, Thailand's and AID's projects have benefited from the participation of MSU personnel who are committed to the successful development of a modern private seed industry in Thailand, in conjunction with effective and necessary Government programs in the seed sector. They have worked very closely with their Government counterparts as well as with university researchers and private company managers and technicians. They are always available to

provide guidance and advice and have played a role in bringing about the joint ventures between Thai businessmen and U.S. seed producers. They have assisted in the redesign of the Japanese-funded seed processing facility to make it more useful to the overall RTG seed production system.

Technology. The seed centers established under these projects are primarily for rice seed processing. However, because of MSU's design influence, each center is capable of processing an assortment of seeds. This ability was important in the RTG's efforts to produce, multiply, and distribute Suwan 1 corn seed. As the private sector increases its capacity to meet the demands for corn seed, these RTG centers will easily be able to adjust their role for processing other seed types. They now process rice, corn, and some minor crop seeds. The design of these centers serves as a model for the private sector. Private firms have responded to the encouragement to visit and receive advice and training on the operation of these centers. Thus, the centers have served to increase the likelihood of the application of appropriate technology.

Another technological aspect was the decision to establish several smaller seed centers close to the areas of need rather than to construct one massive facility in an attempt to meet all needs at some preconceived economy of scale. This would have been inappropriate given market size in Thailand and would not have provided the resultant benefits to the development of a modern private seed industry.

Demonstration. Perhaps the most important role played by these seed centers has been their ability to demonstrate to private enterprise the viability of a private seed industry in Thailand, given the appropriate technology both in design and management. More directly, they have served as working prototypes for private firms desiring hands-on experience.

Training. The importance of U.S. training and education has already been discussed. Such projects have contributed substantially to seed development and have provided Thailand with the trained personnel base required to continue the private industry development process.

2.3.4 Other AID Projects

The team made no attempt to investigate all AID projects in Thailand over the past 32 years, but the importance of several projects should be noted.

The extensive highway and rural road network throughout Thailand to which AID contributed has made possible the rapid development and expansion of modern agriculture, of which improved seed is a vital part. This element of public infrastructure is fundamental to any rural industry development.

Many other AID agriculture and rural development activities also have improved overall management of the agricultural sector.

The International Executive Service Corps (IESC) is a program supported by an AID central bureau, the Bureau for Private Enterprise, with a core grant and by AID Field Missions through specific projects. The IESC has had a resident country coordinator in Thailand for about 19 years. During this period, IESC has provided the services of retired U.S. executives and technical professionals to over 155 private Thai companies and 8 RTG offices under more than 270 separate assignments. This has been another means of transferring technical and management knowledge to Thailand.

The team was able to meet with the most recent of three IESC volunteers who have come to Thailand specifically to assist private Thai seed companies. The volunteer was on his second assignment to this firm and had an application in process for his third assignment next year. This individual has been working with the oldest Thai seed firm, a vegetable seed company, assisting in modifying management practices to enable it to remain competitive in today's rapidly expanding and modernizing Thai private seed industry.

2.4 Other Donors

There have been several other international donors and organizations that have played important roles in the development of Thailand's modern seed industry. Brief descriptions of their contributions are provided below.

2.4.1 Japan

There are two Japanese agencies involved in Thai seed development, the Japanese International Cooperation Agency (JICA) and the Overseas Economic Cooperation Fund (OECF). JICA provides financing in grant form and financed the design and construction of the DOAE's Seed Center No. 5 near Lopburi. This center is presently limited by design to the processing of corn seed. This feature has restricted its role in the transfer of appropriate technology and practices to the modern private seed industry. The engineering designs have been completed, with Mississippi State University assistance, to modify this center to permit the processing of additional types of seed.

OECF provides financing in loan form and is financing the construction of 12 additional seed processing centers throughout Thailand. These seed centers are similar in scale to the AID-financed seed centers, and are intended primarily for rice seed processing. Each will have the capability, however, of processing seeds of one or more other species. These additional seed centers should provide the RTG with sufficient capacity to assure the availability of high-quality processed rice seed to its farmers. In addition, these centers will expand the ability of the RTG to introduce processed seeds of improved varieties as they are developed, and will serve as demonstration centers for the private seed industry just as AID's seed centers did with Suwan 1.

2.4.2 European Economic Community

The European Economic Community (EEC) was instrumental in the development and growth of Thailand's cassava (tapioca) industry and is now financing the construction of three rice seed processing centers in Thailand's southern peninsula. These centers will complete an adequate nationwide network of appropriately scaled seed processing centers to be operated by the RTG.

2.4.3 Food and Agriculture Organization

The Food and Agriculture Organization (FAO) has its regional office in Bangkok. Its role has been the transfer of technology through seminars and workshops, bringing together government and private sector representatives from countries facing similar problems in their agricultural development activities. The current thrust of its activities is to examine the relative roles of the government and private sectors in FAO workshops to be held

over the next 3 years. The final workshop will be held in Bangkok and will highlight the reduced role of government as private enterprise progresses in its capacity to meet demand. Thailand will serve as the example of successful policy.

2.4.4 International Center for Maize and Wheat Improvement

The International Center for Maize and Wheat Improvement (CIMMYT) works in cooperation with the RTG and Kasetsart University in the development of improved corn varieties. CIMMYT has not played a significant role in the development of Thailand's modern private seed industry.

2.5 Domestic and International Private Seed Initiatives

When the RTG introduced Suwan 1, built seed centers, and demonstrated that Thai farmers were willing to accept and pay for improved varieties and quality seed, the private sector recognized both the changes in market potential and the fact that the RTG was unable to meet market demand. There were a number of Thai agribusiness firms active in grain trading, livestock, poultry, chemicals, and other agricultural activities. Many of these firms had strong links to active international seed companies. Following are examples of Thai private agribusiness companies that responded rapidly to the obvious opportunity.

The mother company of the powerful Chareon Pokphand (C-P) Group of Companies is the 60-year-old vegetable seed company, Chia Tai. C-P had old and strong links to DeKalb AgResearch Company, U.S.A., through the swine and poultry business. DeKalb has a strong international hybrid corn and sorghum program. In response to the opportunity, C-P formed three new companies to handle its entry into the corn and sorghum market, built a major processing plant, and currently is producing Suwan corn varieties and introducing DeKalb hybrid corn and sorghums. C-P has expressed an interest in soybean seed and is testing sunflowers. C-P is benefiting from BOI incentives.

Cargill Company has been active in Thailand as a buyer and exporter of tapioca. Cargill, U.S.A. has an active international seed program. The company took advantage of the opportunity in Thailand, built a small plant producing Suwan 1, and introduced corn and sorghum hybrids. The small plant operates at full capacity, and there are plans to build a major seed processing plant in the near future. Cargill is benefiting from BOI incentives.

Pacific Seed Co., Ltd., in Australia is owned by Continental Grain Co., a U.S. firm, which has been active in Thai grain

trading for many years. Pacific Seed (Thai) Ltd., formed to take advantage of the opportunities in hybrid corn and sorghums, built a major processing plant and elected to go directly to production and marketing of hybrids, rather than using Suwan 1 as a business bridge to hybrids. It also is benefiting from BOI incentives.

Pioneer Hi-Bred International, U.S.A. is the world's largest hybrid corn seed company and has a long-term "go slow" strategy related to entering Third World markets. In tropical countries it usually opens a research operation and runs it for a number of years. During this time, products are tested and inbreeding may be conducted. Also, Pioneer assimilates data on the country and its climate and assesses business possibilities. When and if the time is right, Pioneer retains all research and control of in-breeds and selects a local company to produce and market Pioneer hybrid corn and sorghum. A Pioneer research unit was in Thailand in the early 1970s, left for a few years, and returned when the time was considered more favorable in the late 1970s. Pioneer has selected the Thai company Super Seeds as its distributor. Super Seeds initially was formed by an existing agribusiness company to produce and supply Suwan 1. Super Seed built a small processing plant, is now considering building a major plant, and actively markets Pioneer products.

Agro-Seeds, Ltd., is the seed activity formed within Ciba-Geigy's long-existing Thai agricultural chemicals operations. Ciba-Geigy owns Funk Seed, U.S.A., which is a major hybrid corn and sorghum company. Currently Agro-Seeds is conducting research and product evaluation only. Plans are to enter the hybrid corn and sorghum market in the future.

Several other Thai companies are planning to engage in the marketing of variety and hybrid corn and sorghums through a private brand program. That is, they will purchase sufficient quantities of seed produced and packed by others under any brand name specified by the buyers.

The new private sector seed initiative has developed by linking existing Thai agribusiness firms with experienced international seed companies. Most of these links existed before the new Thai seed development phase and were ready to be used when the opportunity arose. If the RTG maintains its policies, investment and the introduction of new products in corn and sorghum will increase in the private sector. The expansion may come through increases within existing companies or by additional Thai agribusiness/international seed company links. Either way the Thai farmer and economy will benefit. After the new companies are positioned in the corn and sorghum markets, they will assess other secondary seed activities for potential involvement. Soybeans, mung beans, peanuts, and sunflowers have been mentioned as secondary possibilities. Again, the Thai farmer and economy

will benefit from this RTG-supported private investment and interest.

An effective private agricultural input distribution system has been in place for many years and is now being used by all the new private seed companies and, on a limited, unofficial basis, by the Government. There are hundreds of small merchants throughout Thailand providing all types of agricultural inputs at the village level. For decades, these merchants have traded in farmer-produced seeds important to the local area (many times the only source of seed); vegetable seed coming from the older, established vegetable seed companies; agricultural chemicals; and fertilizer. In addition, many of them have provided farm credit. Their importance cannot be overemphasized. They are the people who are willing to buy a 500-gram can of vegetable seed and repackage it in smaller amounts to sell to farmers, to buy 25-kilogram bags of fertilizer and re-bag it to meet the farmer's needs, and to provide many other such functions. They are also a powerful source of information for the farmer. Because they provide credit and many times buy back the farmer's crop, their influence is great.

One minor problem is that many people in Government, and even to a degree in the private sector, give little credit to the village merchants' place in the distribution chain, and feel that they may be making "too much" profit and may be unethical in their dealings with farmers. There has been some ethnic bias involved (a large percentage of merchants are of Chinese ancestry). The DOAE extension agent assigned to work with farmers and the merchant dealing directly with farmers have limited contact with each other.

2.6 Banking and Credit

The extension of credit has been a critical factor in the development of Thailand's modern private seed industry. The primary sources of credit for farmers are Government and private banks and merchants, with the latter estimated to be providing nearly 70 percent of farmers' credit needs.

Credit has been critical for the development of the seed industry. Individuals in need of credit have little choice but to take the advice of those who provide credit when such credit is conditioned upon acceptance of that advice, which is almost always the case either explicitly or implicitly. In practice, a farmer will purchase seed and other agricultural inputs from the merchant who buys his grain production. Most, if not all, of what the farmer purchases will be on credit, to be repaid to the merchant out of the farmer's harvest which will be "sold" to the

merchant. It is in the best interest of the merchant to provide such credit customers with quality inputs and sound advice on farm management practices. This increases the likelihood of the farmer's success and thus of prompt and complete repayment of credit to the merchant. This is common practice in Thailand. The limiting factor is the merchant's own knowledge of improved inputs and farm practices.

Other variables of importance to the merchant are the profit margins on the various items in inventory, the terms on which these items are received, and customer acceptance of and feedback on goods sold. These are simply basic market forces at work and have proved to be effective in quickly identifying appropriate cost-benefit factors for new products in the market. In addition, the primary revenue source for merchants is the onward sale of the farmer's production. Thus, actions taken by farmers that result in increased yields of good quality products increase the merchant's revenues, assuming a reasonable market price for the given commodity.

This combination of interests has made the merchant a critical element in the development of a modern seed industry as well as in the overall development of the agriculture sector. Merchants were quick to accept and promote Suwan 1 because of its resistance to disease and higher yield characteristics. By providing Suwan 1 to their farmer customers, credit risk was reduced and overall revenues increased because of higher yields. Hybrid corn is now being promoted by merchants for the same reasons. Thus, farmers respond to the advice of their merchant because the merchant is many times the source of both credit and inputs, and the ultimate buyer of the farmer's product. In turn, merchants are themselves customers of banks, through which they receive loans that assist them in granting credit to farmers.

Government and private banks are also a source of direct credit for farmers, providing perhaps 30 percent of their credit needs. The RTG's Bank of Agriculture and Agricultural Cooperatives (BAAC) is the primary source of Government credit for small farmers. After years of problems with its supervised cash credit programs and difficult collection, the BAAC has devised an innovative and effective means to meet its client needs. To reach the maximum number of smaller, more needy farmers, one of BAAC's programs requires the formation of a group of up to 15 farmers who are jointly and individually responsible for repayment of credit extended. Under this scheme, peer pressure and cooperative teamwork improve the performance of each member of the group and enhance BAAC collection prospects significantly.

In addition, because of the difficulty in knowing what a borrower actually uses cash credit to purchase, BAAC has begun

extending credit in-kind. Because of an extensive branch network, BAAC can maintain adequate inventories of major agriculture inputs at locations easily accessible to farmers. For the seed industry, this has guaranteed that farmers who are BAAC borrowers will use improved seeds and even some hybrids. The farmer has no choice when seed credit is provided in-kind. Credit in-kind for seed began in 1982 with 4.61 million Baht (US\$200,000) in credit extended and grew to an estimated 6.0 million Baht (US\$260,870) in 1983 (BAAC fiscal year, April 1 to March 31). This is an effective means to extended credit and a particularly effective means to introduce new technology, particularly improved seed, to farmers.

The private banking sector is also a significant source of farmer credit. For example, Bangkok Bank Ltd., founded in 1944 and perhaps the most progressive private commercial Thai bank, not only extends direct credit to farmers but also is testing and refining an in-kind credit program for farmers. Although Bangkok Bank Ltd. has an extensive branch network, it does not maintain an inventory of agricultural inputs as does BAAC. Instead, it is developing a chit scheme whereby client farmers make application for loans for specific purposes and then receive chits redeemable for specific agricultural inputs from cooperating private merchants who are also clients of Bangkok Bank Ltd. Repayment is made in cash. As currently conceived, this chit scheme does not ensure use of improved seeds by farmers, because the bank has no control over inventory, but the bank does promote improved inputs. Nonetheless, given the incentives driving the merchant, it is likely that a majority of the seed provided will be of the improved varieties, and the bank is in a position to determine from which merchants the farmer may obtain inputs.

All other private commercial Thai banks also provide credit to farmers, either directly or by providing funds to BAAC for its programs. RTG regulations implemented by the Bank of Thailand require that commercial banks annually extend loans to the agricultural sector equal to 13 percent of deposits received, with not less than 11 percent of that amount in the form of direct farmer loans and the balance to rural agribusiness. In addition, regulations concerning branch office establishment require that within 2 years, 60 percent of all deposits be loaned locally, with 20 percent going to the agricultural sector. Programs such as these should eliminate lack of credit as a constraint to farmers' obtaining improved seed and other inputs to complete a sound management program. Further, such pressure on commercial banks, as well as on BAAC which must accept funds from commercial banks, may lead to even more innovative and progressive credit packages than those now being implemented by BAAC and Bangkok Bank Ltd.

The negative side to such regulations is that they represent an artificial, if not arbitrary, credit market, and thus tend to distort market forces. The present practice of holding the various percentages where they are, waiting until the market has sorted itself out, and then determining if the percentages should be adjusted upward or downward, is sound. Flexibility is essential.

3.0 CURRENT GOVERNMENT/PRIVATE SECTOR RELATIONS

There is much open and free dialogue between the RTG, universities, and the private sector within Thailand's seed industry. During the course of interviews, the team learned of several concerns that are current subjects of dialogue. As will be shown, there are no major points of disagreement between the Government and the private sector.

3.1 Seed Club

A result of the USAID-supported Seed Development Loan II Project was the establishment of the Seed Club, which meets monthly. Membership is open to anyone interested in seed, including RTG officials. It is anticipated that the Club will become a legal association in the future, with a status similar to that of a trade association in the United States. Recent Club meetings have dealt with the role and organization of the group. Complete agreement among the members has not yet been achieved on what the purpose of the Club should be.

While somewhat disappointing, such uncertainty is not unexpected. The Club is new and it comprises young firms in a young industry. Each of the members has still-developing corporate strategies. It is not surprising that such an organization does not yet have a firm grip on its purpose and direction.

3.2 Seed Regulations

The current Thai Seed Law is well conceived and adequate. It is a brief, "truth in labeling" sort of law, and nothing more. Any change to a more complicated, rigid model would only serve to stifle private enterprise. An encouraging and not surprising comment frequently made by the private Thai seed producing firms is that the RTG should strive to enforce more strictly the existing Seed Law. Stricter enforcement, would protect private firms striving to exceed minimum standards from firms that do not meet

standards, and the reputation of the seed industry as a whole would be enhanced in the eyes of the farmer. Professional seed firms have no difficulty in meeting standards and even use better-than-standards test results as a marketing tool.

3.3 Differential Pricing

At present, RTG and university-produced seed of improved corn varieties (i.e., Suwan 1 and 2) are sold from the seed processing centers directly to farmers and Government agencies at 7.00 Baht per kilogram. Because seed centers, Government or private, do not want carryover seed stock, every attempt is made to sell the stock. The RTG and university centers have no distribution system. Thus, in order to move inventory, seed is often allowed to slip into the private distribution chain. A merchant will compile a list of farmers, take a truck to the seed center, submit the list, and then sell such seed at 8.00 to 9.00 Baht per kilogram from his shop, physically alongside commercially produced Suwan 1 and 2 selling at 12.00 to 14.00 Baht per kilogram. The listed farmers may or may not be actual purchasers of the seed.

Allowing RTG and university seed to enter the private distribution chain is not inappropriate, especially since the alternative would be wasted seed. This avenue assures that this improved seed will be planted and will contribute to the economy.

The direct competition at the merchant's shop is not a problem for private enterprise, because the entire RTG and university production of improved corn seed is only around 10 percent of total corn seed planted, and private enterprise cannot yet satisfy the demand for improved corn seed. The cheaper seed clears the market quickly and commercial seed follows.

The problem lies in the significance attached by the farmer to the price difference. RTG and university Suwan 1 seed is the same as a private company's Suwan 1 seed, but the farmer perceives a wide difference in price, damaging the image of private firms. The private firms producing Suwan 1 are covering production and sales costs and providing a margin to merchants in their pricing structure. The RTG and university pricing scheme does not cover production costs, much less any of the remaining costs to private enterprise.

4.0 CONCLUSIONS AND SUGGESTIONS

The team presents its conclusions and suggestions below. We make suggestions rather than recommendations because our interest is not to recommend actions, but, rather, to encourage the consideration of our suggestions as possible aids to an already excellent effort.

4.1 Conclusions

1. Many positive attitudes, events, and actions by the RTG across a span of 30 years, and the RTG's wise use of inputs from various international government and private agencies and organizations, have resulted in the development of a modern seed industry.

2. The new private seed sector has followed up on an initiative by the RTG. It is making a substantial contribution to the corn seed supply and leading in the development and introduction of hybrid corn and sorghum seed. It is likely that a large percentage of the corn crop will be planted with higher yielding corn hybrids in the future. An expanded sorghum industry could develop, based on modern hybrid sorghums. Developing nations that can provide a good business opportunity in profitable seed species can attract private sector investment.

3. At present, most of the work in soybean and mung bean seed is being done by the RTG. Many of their planned new seed centers are designed to process soybean and mung bean seed. The private sector is also considering these two crops as secondary seed activities, after corn and sorghum. Under favorable conditions the RTG may get help from the private sector in the production and supply of these seeds. It is difficult for developing countries to attract private investment for the development and production of new seed of lower profit species unless the possibility already exists to enter business in higher profit seed crops.

4. Rice is Thailand's most important crop, but is viewed by the private sector as an uninteresting, unprofitable seed activity. The Government has taken responsibility for rice variety improvement and for the production and distribution of high-quality rice varieties. The Rice Institute (RI) has breeding and foundation seed responsibility. DOAE, which has four seed processing plants (USAID Seed Development Loan I) processing rice and other seeds, is responsible for rice seed production. With Japanese and EEC loans, DOAE has plans for 13 to 15 more seed centers to process rice seed. If the RTG completes these projects, develops professional seed center staffs, and provides

appropriate funding for the RI and the DOAE Seed Division, Thailand could have an outstanding rice seed program. Many major open-pollinated crops, such as rice, wheat, and cotton, are very important in developing nations, but the seed activity related to the crop is so unprofitable that it will not attract private investment. In these cases, the Government must do the seed and crop improvement work.

5. The vegetable seed industry is an older, more established activity traditionally associated with private sector business. There are signs of increased professionalism and opportunities in this sector also. More vegetable seed is being produced locally by companies through controlled contract production and quality control. Thai vegetable seed firms are trying new products and are beginning to enter into seed multiplication contracts with foreign vegetable seed firms to contract-produce seed for re-export. This raises the technical level of the Thai firm, is good income for the Thai contract farmer, and increases Thailand's exports. The RTG plans to build two small vegetable Seed Centers (USAID Seed Development Loan II) to provide improved foundation vegetable seeds of important local varieties. For the developing nation, the importation of vegetable seed (some cannot be grown locally and must be imported) and its local distribution provide the easiest entry to the seed industry for the private sector. At the same time, the import and distribution of vegetable seed is never a major activity in terms of the national food need or economy.

6. Thailand's seed industry is built on a firm foundation, is developing at a fast rate with a good Government/private sector balance, and could become an outstanding developing country model in another decade.

4.2 Suggestions for the Royal Thai Government

1. The DOAE should continue to improve the professionalism of extension agents; the quality of the agents' knowledge and work habits are more important than the number of agents per farmer.

2. The DOAE should consider providing training courses at the local level on improved inputs and farm practices for merchants dealing with farmers. The merchant has regular contact with the farmer and is a provider of information. The DOAE could increase the flow of new ideas and correct information by training the merchant. This process would be facilitated if the DOAE agent and the merchant develop a good working relationship.

3. The DOAE should consider developing the capability to conduct a quick-germination test (T-Z or electronic seed analyzer) at DOAE offices in provinces and subprovinces that have concentrations of seed merchants and offer free or very low cost, quick-germination tests for seed merchants and farmers. The merchant would be most likely to use the service because he or she trades in farmer-produced seed sold back to local farmers with no real knowledge of the most basic seed quality--germination. The merchant would have to be convinced of the importance of knowing the germination of farmer-produced seed in stock as an aid to building a reputation as a quality-minded seed dealer. The merchant would know how good the seed offered for sale is and when it is unsafe to sell. We think competition among merchants would cause the service to be used once it was understood. This would improve the quality of seed at the lowest, least professional level of the seed distribution chain, to the benefit of the Thai farmer.

4. The RTG should consider holding its corn seed production at no more than current levels, allowing the private sector to produce for the increasing demand. This could be accompanied by a reduction in the flow of RTG corn into private retail shops to encourage private investment in facilities and personnel for the processing and distribution of corn as well as other types of seed. The future hybrid corn and sorghum industry can be established on this investment base.

5. Consideration should be given to gradually increasing the price of Suwan corn seed to cover the true costs of production and seed center overhead.

6. Corn and sorghum hybrid research conducted at Ministry of Agriculture and university breeding stations should focus on advanced inbreds, not the production and distribution of hybrids. Seed of these inbreds should be offered (sold) to the private sector, and the private sector should be encouraged to develop finished hybrids and to be responsible for their production and distribution.

7. The easily understood Seed Law is adequate for Thai seed industry development. It is a good "truth in labeling" law which is needed and well accepted by the professional private seed sector. We suggest that the RTG keep its Seed Law uncomplicated.

4.3 Suggestion for USAID

1. It has come to the attention of the study team that there may be a timing problem related to the Seed Development Loan II project. The contracts of the two MSU seed specialists

are scheduled to end June 1985, but the seed centers to be constructed under the project will not be completed and operating until 1986. We suggest the MSU seed specialists' contracts be extended at least to June 1986. We believe that the specialists' experience with these projects and their technical assistance is needed through construction and startup of operations.

2. In addition to Seed Development Loan II, we suggest that USAID continue to train Thais at the graduate level and with short courses in all aspects of agriculture. Although the program initially may be for Thai Government employees, it provides a valuable human resource available to the RTG and the private sector to support Thailand's technically based agricultural expansion.

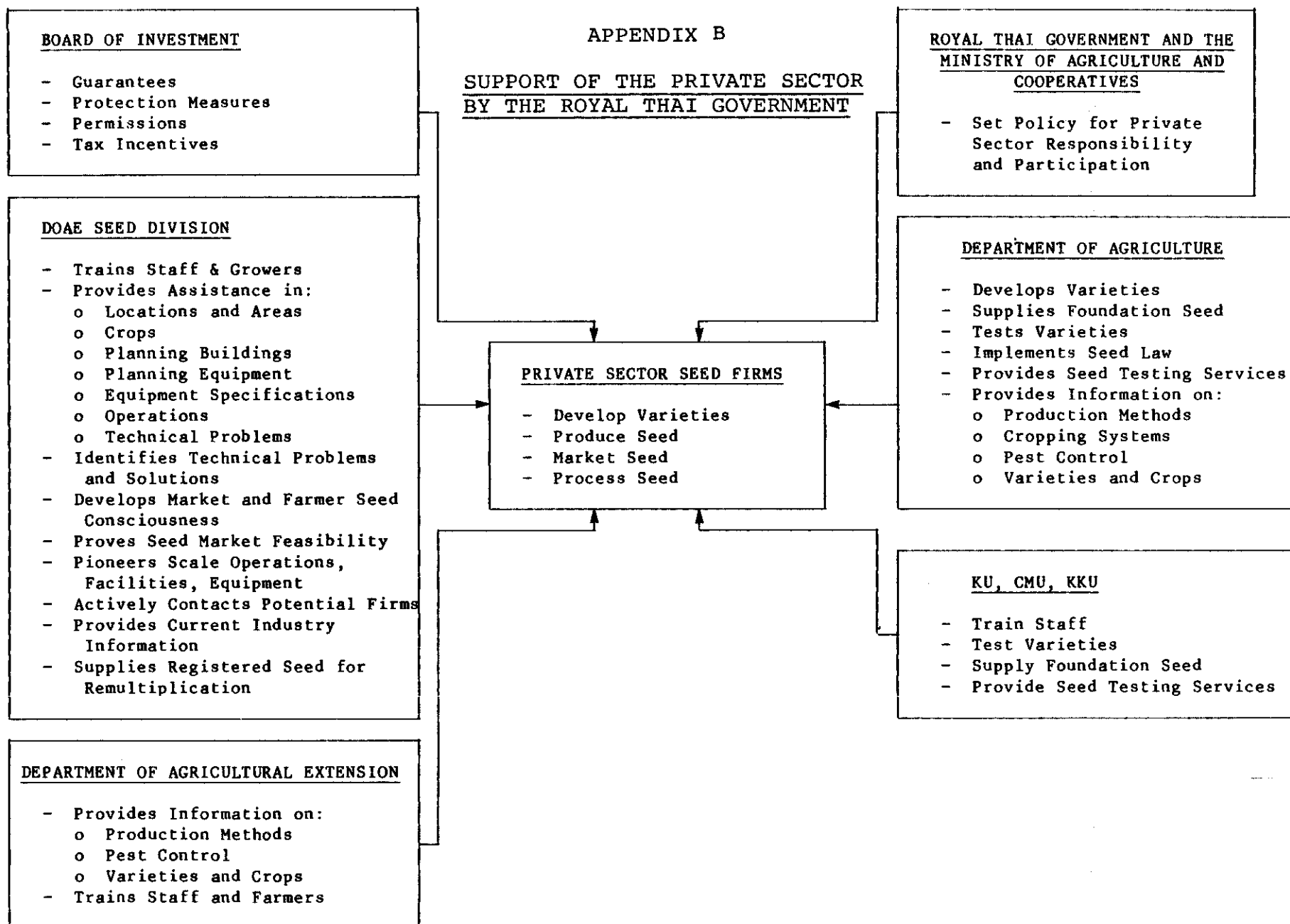
3. In the highly technical and complex seed industry, a balance of Government and private involvement is required. In some developing countries, the political and economic situation is such that only the government is capable of building a foundation for future private involvement. The best situation is one in which government programs and private initiative can work in cooperation, each doing what it can do best. Neither can effectively do the best job alone. Government is always in control of the power of policy that can encourage seed industry development or destroy it.

APPENDIX A

SEED POLICY OF THE ROYAL THAI GOVERNMENT¹

1. To promote farmer use of high-quality seed of improved varieties in order to increase productivity and farm income, in compliance with the National Economic and Social Development Plan.
2. To multiply high-quality seed of improved, higher yielding varieties developed by the Department of Agriculture and other research institutions. This seed produces higher yielding crops and provides resistance to diseases and insects, and will be used in the programs of Government agencies for distribution to farmers and for disaster relief programs.
3. To encourage farmers, agricultural institutions, and the private sector to produce high-quality improved seed for distribution in both domestic and foreign markets.

¹Policy information is taken from the Department of Agricultural Extension, Seed Division, "Directory of the Thailand Seed Industry 1983."



APPENDIX C

THAI SEED REQUIREMENTS, 1984-1986

Crop	Area Planted (in 1,000s of rai) ^a	Total Seed Needed (tons) ^b	Estimated Seed Requirement of Government Projects (tons)			Estimated Seed Needed for Distribution by Farmer- Assistance Programs (tons)			Estimated Pre- sent Farmer Demand for Commercially Supplied Seed (tons)	% of Total Seed Used
			1984	1985	1986	1984	1985	1986		
Rice	58,600	293,000	9,000	10,000	10,000	-	4,650	9,450	73,250	25
Corn	10,000	40,000	6,500	8,000	8,000	-	-	-	12,000	30
Sorghum	1,500	4,500	10	10	10	60	70	90	1,350	30
Mung Bean	2,800	11,200	900	1,000	1,000	1,700	850	825	2,800	25
Soybean	1,300	7,800	2,000	2,500	3,000	-	-	-	1,950	25
Peanuts	1,000	20,000	300	300	500	-	2,750	3,425	5,000	25
Cotton	1,000	3,000	850	900	900	-	-	-	750	25
14 Vege- tables	780.4	1,900	3.83	3.83	5.13	-	3.16	16.39	950	50
Total	76,980.4	381,400	19,563.83	22,713.83	23,415.13	1,760	8,323.16	13,806.39	98,050	

^a6.25 rai = 1 hectare.

^bAt recommended planting rates.

Source: Department of Agricultural Extension, Seed Division, "Directory of the Thailand Seed Industry 1983."

APPENDIX D

ESTIMATED SEED PRODUCTION OF THE DEPARTMENT OF AGRICULTURAL EXTENSION SEED PROGRAM, 1984-1986

Crop	Seed Production Targets of the DOAE Seed Division (tons) ^a			Percentage of Total Seed Needs Produced by DOAE			Percentage of Farmer Demand for Improved Seed Which Will Be Supplied by DOAE		
	1984	1985	1986	1984	1985	1986	1984	1985	1986
Rice	3,750	13,450	17,950	1.28	4.59	6.13	5.12	18.36	24.50
Corn	2,900	2,900	3,000	7.25	7.25	7.5	24.10	24.10	25.00
Sorghum	70	80	100	1.56	1.78	2.22	5.18	5.92	7.40
Mung bean	500	1,150	1,625	4.46	10.26	14.50	17.86	41.07	58.03
Soybean	500	800	1,000	6.41	10.26	12.82	25.64	41.02	51.28
Peanuts	1,675	2,950	3,725	8.37	14.75	18.62	33.50	59.00	74.50
Cotton	350	400	400	11.66	13.33	13.33	46.66	59.33	53.33
14 Vegetables	<u>3.63</u>	<u>6.99</u>	<u>21.52</u>	0.19	0.37	1.13	0.38	0.73	2.20
Total	9,748.63	21,736.99	27,821.52	2.56	5.69	7.29	9.94	22.17	28.30

^aTotal production capacity of the 20 Seed Centers is 31,000-40,500 tons.

Source: Department of Agricultural Extension, Seed Division, "Directory of the Thailand Seed Industry 1983."

APPENDIX E

DEPARTMENT OF AGRICULTURAL EXTENSION SEED CENTERS¹

1. SEED CENTERS NOW IN FULL OPERATION

- No. 1. PHITSANULOK USAID Loan
Phitsanulok-Loamsak Highway, Km. 11
Wang Thong District
Phitsanulok

Telephone: (074) 611-193
Chief: Mr. Tawee Pluemsab
Crops: rice, corn, mung bean
- No. 2. KORAT USAID Loan
Korat-Chokechai Highway, Km. 4
No. 50, Tambon Whoa Ta lae
Nakhon Rachasima

Telephone: (044) 244-859
Chief: Mr. Panoo Satayavibul
Crops: rice, corn, sorghum, peanuts
- No. 3. LAMPANG USAID Loan
P.O. Box
Chiang Mai Highway, Km. 11
Amphur Muang
Lampang

Telephone: (054) 218-865
Chief: Mr. Amnart Bukhum
Crops: rice, soybean, peanuts

Chiang Mai Seed Production Sub-Center
Chiang Mai-Hangdong Road, Km. 7
Amphur Muang
Chiang Mai

Crops: rice, soybean, peanuts

¹The information in this appendix is derived from the Department of Agricultural Extension, Seed Division, "Directory of the Thailand Seed Industry 1983."

- No. 4. CHAI NAT USAID Loan
 Banrai Pattana-Tambon Hangnamsakorn Road
 Amphur Manorom
 Chai nat
 Chief: Mr. Pirome Lochaiyakul
 Crops: rice, corn, mung bean, cotton
- No. 5. LOPBURI JICA, Japan
 P.O. Box 1s5 AID
 Amphur Phraphuttabat, Km. 8
 Phraphuttabat-Patana Nikhom Highway
 Lopburi
 Chief: Mr. Paiboon Ploylearmsang
 Crops: corn

2. DOAE PLANNED NEW SEED CENTERS

The European Economic Community (EEC) is financing three seed centers in the south, to be located in Patthalung, Surat Thani, and Pattani. Patthalung Seed Center is under construction and expected to be in operation in 1985.

Overseas Economic Cooperation Fund (OECF) assistance will help develop 12 more seed centers, 7 of which are under construction.

USAID Phase II is helping finance two seed centers, at Chiang Mai and Kalasin.

- No. 6. PATTHALUNG EEC Grant
 Tambon Kuon Marprao Aid
 Amphur Muang
 Patthalung 9300
 Chief (Acting): Mr. Paisarn Karnjanaraj
 Crops: rice, peanuts
- No. 7. CHIANG MAI USAID Loan
 Tambon Mae Hia
 Amphur Muang
 Chiang Mai
 Crops: vegetable seed, rice, soybean
- No. 8. KALASIN USAID Loan
 Tambon Kuan Si Ton
 Amphur Muang
 Kalasin
 Crops: vegetable seed, peanuts

- | | | |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| No. 9. | <u>PAYAO</u>
Payao-Phrae Highway
Tambon Tah Wanthong
Amphur Muang
Payao

Crops: rice, soybean | OECF Loan,
Japan |
| No. 10. | <u>KAMPAENGPHET</u>
Tambon Non Pling, Km.6
Amphur Muang
Kampaengphet

Crops: rice, mung bean | OECF Loan,
Japan |
| No. 11. | <u>PHRAE</u>
Phrae-Nan Highway, Km.80
Tambon Mae Bang Hah
Amphur Rongguang
Phrae

Crops: rice, soybean, peanuts | OECF Loan,
Japan |
| No. 12. | <u>NAKHONSAWAN</u>
Asian Highway
Tambon Klang Dad
Amphur Muang
Nakhonsawan

Crops: rice, mung bean | OECF Loan,
Japan |
| No. 13. | <u>UBOL RATCHATANI</u>
Agricultural Extension Office
Ubol-Roi Et Highway
Amphur Muang
Ubol Ratchatani

Crops: rice, peanuts | OECF Loan,
Japan |
| No. 14. | <u>ROI-ET</u>
Amphur Tawatburi, Km. 8
Roi-Et

Crops: rice, peanuts | OECF Loan,
Japan |
| No. 15. | <u>UDORNTHANI</u>
Opposite Chiang Pin Land Settlement
Office
Udornthani-Roi Et Highway
Amphur Muang
Udornthani

Crops: rice, peanuts | OECF Loan,
Japan |

- | | | |
|---------|---------------------------------------------------------------------------------------------------------------------------|---------------------|
| No. 16. | <u>SURIN</u>
Surin-Srikorapum Highway
Tambon Chuaplerng
Amphur Prasart
Surin

Crops: rice, peanuts | OECF Loan,
Japan |
| No. 17. | <u>KHON KAEN</u>
Ban Nong Pai
Tambon Samran
Amphur Muang
Khon Kaen

Crops: rice, peanuts | OECF Loan,
Japan |
| No. 18. | <u>SAKON NAKHON</u>
Poochaej Village
Tambon Muangkai
Amphur Pangkoan
Sakon Nakhon

Crops: rice, peanuts | OECF Loan,
Japan |
| No. 19. | <u>CHOLBURI</u>
Tambon Nahrerk
Amphur Pannasnikom
Cholburi

Crops: rice, mung bean | OECF Loan,
Japan |
| No. 20. | <u>RAJCHABURI</u>
Tambon Hauyphai
Amphur Muang
Rajchaburi

Crops: rice, mung bean | OECF Loan,
Japan |
| No. 21. | <u>SURAT THANI</u> | EEC Grant
Aid |
| No. 22. | <u>PATTANI</u> | EEC Grant
Aid |

APPENDIX F

THE SEED CLUB OF THAILAND

The seed industry exists to serve farmers. Improved higher yielding seed cannot be produced without the high technology applied by the seed industry, but seed are produced first by farmers, and the resulting produce is in turn used by farmers. To increase their yields and income, farmers need the seed industry; however, the seed industry cannot be effective unless (1) farmers are educated and motivated to use improved seed, (2) they know and trust their seed supplier and his seed, (3) seed production is coordinated in a way which benefits both the seed industry and farmers, and (4) the seed supplied is truly better than what farmers can provide on their own.

The seed producer's competition is not other seed producers --it is low-yielding, low-quality grain used for seed. Recognition of this should enable the private sector and Government agencies involved in the seed industry to work together in Thailand; to coordinate the seed supply according to real need; to be more effective in educational promotion and marketing; to avoid losses; to reach more farmers without wasting or duplicating sales efforts; to foster cooperation among private sector suppliers and the concerned Government agencies; and to help develop public policies that are in the best interests of the farmer, the consumer, the public, and Thailand's national economy.

To achieve these objectives, the Seed Club of Thailand was formed. Organized as an industrial "club," both private sector and Government agencies participate.

Officers of the Seed Club of Thailand are as follows¹:

Chairman:	Dr. Banjerd Boonsue Managing Director Bangkok Seeds Industry Company
Vice Chairman:	Mr. Petcharat Wannapee Director Seed Division Department of Agricultural Extension

¹Information on Seed Club officers and members was obtained from the Department of Agricultural Extension, Seed Division, "Directory of the Thailand Seed Industry 1983."

Secretary: Mr. Prasert Boonmayam
General Manager
Super Seeds Company

Members include:

1. Bangkok Seeds Co., Ltd.
2. Charoen Seeds Co., Ltd.
3. Charoen Pokphan Co., Ltd.
4. Pacific Seeds Co., Ltd.
5. Super Seeds Co., Ltd.
6. Cargill Seeds, Ltd.
7. The Shell Company of Thailand,
Limited
8. Pioneer Hi-Bred (Siam), Ltd.

APPENDIX G

THAI PRIVATE SECTOR SEED INDUSTRY¹

1. ACE Agriculture Co., Ltd., Bangkok
Crops : Corn, vegetables, watermelon
Activities: Produces seed, imports, exports, engages in contract production and marketing.
2. Adams International Co., Ltd., Bangkok
Crops : Tobacco and hybrid tomato seeds, future Suwan corn varieties
Activities: Produces tobacco seed for domestic market and hybrid tomato seed under export contract.
3. Agro-Seeds, Ltd. (Ciba-Geigy/Funk), Bangkok
Crops : Hybrid corn and sorghum
Activities: Engages in hybrid research and development. Will produce seed for domestic market in the future.
4. Bangkok Seeds Industry Co., Ltd. (C-P Group) Bangkok and Lopburi
Crops : Corn varieties, hybrid corn and sorghum
Activities: Produces and processes seed for Charoen Pokphan Agri-Industry Co., Ltd. Dekalb U.S.A. research connection. Produced 2,900 MT corn seed 1984; estimates 3,800 MT for 1985.
5. Cargill Seeds, Ltd., Bangkok and Pakchong
Crops : Corn varieties, hybrid corn, and sorghum
Activities: Produces and supplies above seed for the domestic market. Produced 1,000 MT corn seed in 1984. Will build new plant in next few years.
6. Charoen Pokphan Agri-Industry Co., (C-P Group) Ltd., Bangkok
Crops : Corn varieties, hybrid corn CP-1, hybrid sorghum DK-54, and mung bean (U-Thong 1)
Activities: DeKalb U.S.A. research connection. Markets above seed domestically under brand name "Lotus." Future interest in soybean seed, testing sunflowers.

¹The information in this appendix is derived from the Department of Agricultural Extension, Seed Division, "Directory of the Thailand Seed Industry 1983."

7. Chia Hah Lee, Ltd., Bangkok
 - Crops : 100 varieties of vegetables
 - Activities: Has processing plant in Bangkok. Imports, exports, produces, and markets vegetable seeds.
8. Chia Tai Agricultural Promotion Co., Ltd. (C-P Group), Bangkok
 - Crops : Vegetable seeds, corn varieties, and hybrids
 - Activities: Has imported, exported, produced, supplied vegetable seed for the domestic market for 62 years. Will market C-P corn in Chia Tai brand in future.
9. Heng Hong Kuan LP, Bangkok
 - Crops : Chinese vegetable seed
 - Activities: Imports and supplies the domestic market.
10. Heng Nguan Kee, LP, Bangkok
 - Crops : Vegetable seeds
 - Activities: Exports, imports, and supplies the domestic market.
11. Laem Thong Industry Co. Ltd., Bangkok
 - Crops : Corn, mung bean, sorghum
 - Activities: Exports. May be in the commodity business, not seed planting business.
12. Mah Boonkrong Rice Mill, Pathumthani
 - Crops : Rice
 - Activities: Produces and supplies rice seed for the domestic market.
13. Nam Thye Chieng LP, Bangkok
 - Crops : Chinese- and U.S.-type vegetable seed
 - Activities: Imports and supplies the domestic market.
14. Pacific Seed (Thai) Ltd., Saraburi
 - Crops : Hybrid corn and sorghum
 - Activities: Breeds, produces, processes, and supplies the domestic market under the brand name "Pacific." Australian company owned by Continental Grain Co. Started marketing of sorghum in 1980, corn in 1981, built processing plant in 1982.
15. Pew Thip International Co. Ltd., Haadyai
 - Crops : Cover crops
 - Activities: Produces and exports, brand name "PT."

16. Pioneer Hi-Bred (Siam), Ltd., Saraburi
 Crops : Hybrid corn and sorghum
 Activities: Hybrid research and development. Super Seeds Co., Ltd. will produce, process, and market Pioneer hybrids domestically.
17. Shell Company of Thailand, Ltd., Bangkok
 Crops : Corn, sorghum, watermelon
 Activities: Another firm will produce and process hybrid corn and sorghum to be sold under Shell brand name. Also imports and supplies the domestic market.
18. Sin Hua Seed Shop, Bangkok
 Crops : Chinese vegetables
 Activities: Imports and supplies the domestic market.
19. South Pacific LP, Bangkok
 Crops : Onion, other vegetables
 Activities: Imports and supplies the domestic market.
20. Super Seeds Co., Ltd., Bangkok
 Crops : Corn varieties, and Pioneer hybrids of corn and sorghum
 Activities: Processing plant at Prachinburi. Will build new plant in next few years. Produces, processes, and supplies corn varieties, corn hybrids, and sorghum for the domestic market.
21. Thai Seed & Agriculture Co., Ltd., Bangkok
 Crops : Vegetable and flower seeds
 Activities: Contracts seed production for proprietary companies. Produces and exports hybrid and open-pollinated vegetable and flower seed. Operations at Chiang Mai, Khon Kaen, Udorn Thani, and Petburi.
22. Upjohn Company, Ltd., Bangkok
 Crops : Vegetables, corn, and sorghum
 Activities: Imports seed and supplies the domestic market under the brand name "Upjohn."
23. Yong Seng, Ltd., Bangkok
 Crops : Chinese vegetables
 Activities: Imports seed and supplies the domestic market.

Note: Private companies 3, 4, 5, 6, 14, 17, and 20 started in the seed business in the late 1970s and early 1980s after the development of improved corn varieties and the construction of seed processing plants by the RTG. Number

16, Pioneer, started research in the early 1970s, left for a few years and returned in the late 1970s. Many of the Thai vegetable seed firms have been in the private seed business of importing, local production, and domestic supply for many years.

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